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VOL. 40 — NO. 6 JUNE, 1959 BARTOW, FLORIDA

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Finding The Best Lemon For Florida ... A Report Of Progress[1]

IV. Florida Lemons For Fresh Fruit Use

By

DR. W. GRIERSON
Florida Citrus Experiment Station, Lake Alfred

The role of lemons as a fresh fruit crop in Florida is not likely to assume major proportions, especially as the new plantings tend to be primarily for cannery use (2). Nevertheless, the study reported in this series of papers would be incomplete without some investigation of the possibilities of these selections when handled as fresh fruit.

Florida lemons are usually apt to be condemmed out of hand as being too large and coarse for the fresh fruit market. This view seems to have become generally accepted without critical evaluation. Attention is therefore drawn to the following description of the California lemon industry prior to 1870. It is taken from the well-known text "The Citrus Industry" (10).

". . . lemons were grown to be sure, but in the markets of San Francisco the fruits were considered to be bitter and much inferior to lemons imported from Italy . . . The California fruits were allowed to ripen on the trees and were consequently large and coarse, whereas the Italian fruits were picked as early as possible and by reason of the long shipment time reached the markets thoroughly cured . . . the great development of the industry in California came only after the introduction and selection of good varieties and the discovery of proper methods of picking and curing."

It would not be true to say that the possibility of Florida lemons responding to proper curing procedures has always been ignored. In a 1923 address to this Society, F. G. Sampson detailed the spot-picking, curing and handling methods that had enabled him to ship as many as 47,000 boxes of lemons in a single year and to receive prices up to $8.75 per box on the Boston Market (8). More recently (1943) Winston and Meckstroth demonstrated that post-harvest fungicides could help to control the heavy decay that otherwise handicaps the shipper of Florida lemons (11).

Previous papers in this series have dealt with the selection of suitable strains of lemons from the point of view of cannery and by-products operations. This paper reports the results of applying to these same selections something of the curing methods that have long ago proved to be so necessary for California lemons.

California Practices

California and Arizona lemons are legally mature solely on the basis of a juice content of 25 per cent or higher (1). Market considerations, however, dictate certain standards of size and color. In consequence the lemon trees are spot-picked repeatedly, the fruits being clipped as they reach commercial size, for which rings are used for guidance of the pickers. These fruit are usually green and on arrival at the packinghouse are washed, given a fungicidal treatment, lightly waxed and sorted into color groups ranging from dark green to yellow.

After color sorting, the lemons are stored in open boxes at 56-58° F. and approximately 85-90 per cent relative humidity (1, 7). Each color group is segregated, the greenest fruit being held for periods of four months or longer. During this period the fruit cures. The peel becomes noticeably thinner; the color changes to deep yellow; the proportion of extractable juice increases, and the soluble solids content (largely citric acid) of the juice increases. Bartholomew and Sinclair (1) quote experiments in which juice yield increased by 6 to 84 per cent during curing and total solids increased by 7 to 24 per cent, the extent of these changes depending on the initial size and color of the fruits and the length of the curing period. Ethylene is occasionally used to hasten degreening, but this is not usually considered desirable. During storage it has been common practice to fumigate with nitrogen trichloride (a fungicide) at approximately weekly intervals.

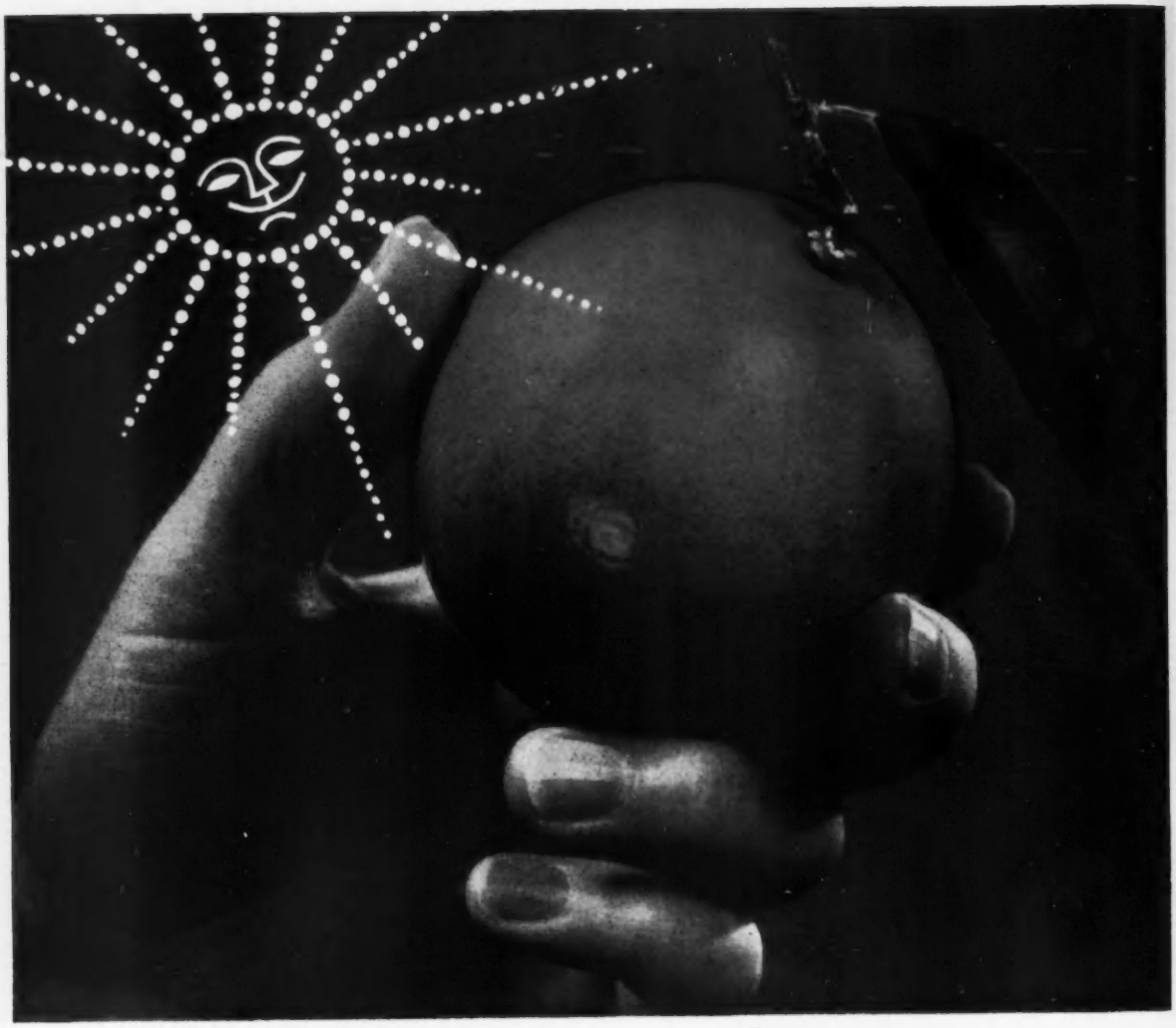
On removal from storage the lemons are washed, given another fungicidal dip, rewaxed, graded, sized and packed in fiberboard cartons for shipment. This packing is customarily done on automatic packing machines (9). A volatile fungicide (ammonia or diphenyl1) is usually used in the shipping cartons (4).

Methods

Neither time nor facilities were available to reproduce the California methods exactly and hence the following improvisations were used. Each sample was harvested for the processing and by-products investigations as described by the preceding authors. At the packinghouse these lemons were washed, dried, and sized. After sizing approximately a field box of the smallest fruit was set aside for fresh fruit use. Thus it should be noted that: these fruits were pulled, not clipped; with each successive picking, the lemons in the box of the smallest fruit tended to be a little larger; and the dark green color paled appreciably by the last picking. In a few varieties, the amount of fruit available was so limited that none could be spared for the fresh fruit experiments and all lemons picked after the freeze

Continued on Page Nine

[1] Florida Agricultural Experiment Station Journal Series No. 819. Presented at Florida State Horticultural Society Meeting, Clearwater, October, 1958.



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Fovea--A Disease Of Concern To Murcott Growers

. . . By . . .

DR. L. C. KNORR
Florida Citrus Experiment Station
Lake Alfred

Up to now, trees of the variety Murcott (Smith tangerine, Murcott Honey orange) have enjoyed a reputation for vigor, early productiveness, and tolerance to cold. But because of the relative recency of their introduction, Murcotts remain an unknown quantity with respect to problems affecting older trees and problems arising from various cultural practices to which they have not yet been exposed.

A number of complaints have been received lately concerning Murcott trees in an apparent state of starvation, which starvation however, is not relieved by fertilization. On inspection, some of these cases were found to result from trunk-girdling cankers that developed after the freezes of recent years. Other cases were traceable to heavy infestations of scale insects, the Murcott evidently being a favored host of these pests. A third type of decline was discovered due to a virus-like disease, and it is this decline that prompts the present note.

Fovea and Its Cause

Cause of this virus-like disease remains to be worked out, but the trouble has all the appearances of being xyloporosis. Until its identity is firmly established, it is thought advisable, for purposes of this discussion, to refer to the trouble as fovea.

To determine whether fovea (rhymes with **phobia**) is caused by the same virus that causes xyloporosis will require several years' time due to the lengthy incubation period characteristic of this virus. This note is published at this time (rather than after transmission trials now in progress demonstrate the causal agent) because available information points up a situation that is potentially dangerous, especially for the many growers who are currently interested in planting this variety.

Distribution of Fovea

That fovea already is a serious problem is revealed by findings of a survey carried out recently among trees in 8 randomly-chosen groves. These properties, located in Highlands, Polk, Lake, and Pasco counties, consisted of plantings 4 years old or more. It is approximately at that age that Murcott trees are sufficiently mature to begin showing the symptoms of fovea. Table 1 indicates that fovea may be absent from some groves and prevalent in others, with the range extending from 0 to 100% infection. What the percentage is in groves less than 4 years—which is the age of the majority of plantings today—cannot be told until trees develop the maturity needed to express symptoms. In addition to the 8 groves sampled and recorded in Table 1, 12 other properties were examined; though detailed counts were not made, these 12 tended to confirm the incidence of fovea shown in Table 1.

Effects and Symptoms

In addition to its apparently widespread distribution, fovea is also important because of its serious consequences to the tree. Growers who are familiar with damage caused

by xyloporosis in Orlando tangelo will have a good idea of the damage caused in fovea-affected Murcott trees because the symptoms and consequence are roughly the same. First symptoms consist of starvation patterns in the leaves and a sparseness of the foliage, particularly along terminal portions of upright branches (Figure 1). This stage soon passes into one where the remaining foliage is huddled around the central axis of the tree which gives to the partially defoliated tree a stagheaded appearance (Figure 2). Affected trees become stunted. Further degeneration leads to death of the tree (Figure 3).

Other external symptoms are also present, and these, too, suggest xyloporosis. In some blocks of Murcotts many trees can be seen with trunks that are severely arched or inclined. Whether this symptom is actually related to fovea is not clear from data collected during the survey. Inclined trunks were often found to be correlated with external and internal symptoms of fovea, but then again other trees with equally inclined trunks were found to be normal. It may be—as in the case of the similar rubbery wood disease described as part of the stem-pitting complex in apples[1]—that inclined trunk is caused by a virus separate and distinct from that causing decline symptoms in fovea.

In addition to external symptoms, fovea also shows the internal pitting and pegging that is characteristic of xyloporosis. As in infected Orlando tangelo trees, these pits occur in the wood under the bark starting at the bud-union and extending up along the trunk (Figure 4). Corresponding pegs are to be found on the inner face of the bark. The pitting may be accompanied by reddish or brownish gumming but at other times may be free of any discoloration whatsoever. Internal symptoms are considered more reliable than decline symptoms in the tops; top symptoms of fovea are easily to be confused with symptoms of other troubles particularly those due to cold cankers along the trunks and to infestations of scale insects. The only reliable external symptoms of infection was found to be the occurrence of flat spots the size of a half dollar scattered over the bark of the trunk. Collectively, these flat spots give the woody cylinder a braided appearance. Such trees invariably showed internal symptoms of pitting, but only occasionally do trees with pits show braided trunks.

The sequence from first appearance of symptoms in the tops to eventual death of the trees may be rapid in some groves (involving as little as a year's time) and slow in others. Trees topworked to Murcott seem to linger longer despite infection (Figure 5) than do in-

[1] Welsh, M. F. and F. W. Keane. Preliminary results in the indexing of apple in British Columbia. Plant Disease Reporter, Supplement 254: 25-29. 1959.

Table 1.—Extent of fovea in eight randomly selected groves.

Grove location and designation	Age of trees (years)	Number of trees examined	Percentage of sample affected by fovea
Highlands County No. 1	4	174	26%
Polk County No. 1	10*	23	3%
Polk County No. 2	5	104	2%
Polk County No. 3	6	216	0%
Lake County No. 1	7	372	26%
Lake County No. 2	7	130	2%
Pasco County No. 1	11	104	7%
Pasco County No. 2	11	10	100%

* These trees were 30-year-old sweet orange trees that had been topworked to Murcott approximately 10 years ago.

Figure 1 — Murcott tree affected by fovea disease; early stage. Note thinness of foliage, sprouty growth through top, and bare upright branches. Tree is 7 years old and is located in the same grove as are trees shown in Figures 2 and 3.

Figure 2. — Fovea disease, intermediate stage. Note shrinking of foliage and defoliated upright terminals.

fected budded trees. Too few groves were examined to be able to say how long it takes before all infected trees come down with symptoms; however, if fovea behaves like xyloporosis in Orlando tangelo, additional cases in Murcott trees might develop as late as the twelfth year after budding, though the majority of infected trees would be showing symptoms within the first 8 years.

Fovea is undoubtedly spread by buds that are taken from infected trees. The original trees in Pinellas County, which are still growing thriftily after 37 years (Figure 6), are obviously not the source of in-

Continued on page sixteen

Figure 3. — Fovea disease, ultimate stage showing death of Murcott tree.

Figure 4. — Fovea disease, showing pitting symptoms in the trunk under the bark. Dotted line indicates the bud union. Notice the occurrence of pitting in the susceptible Murcott scion portion of the trunk, and the absence of pitting in the tolerant Cleopatra mandarin stock portion.

Figure 5. — Murcotts topworked into two neighboring sweet-orange trees about 1950. Tree on left is healthy, tree on right affected by fovea. Both trees photographed at same distance so as to show the stunting that occurs with fovea.

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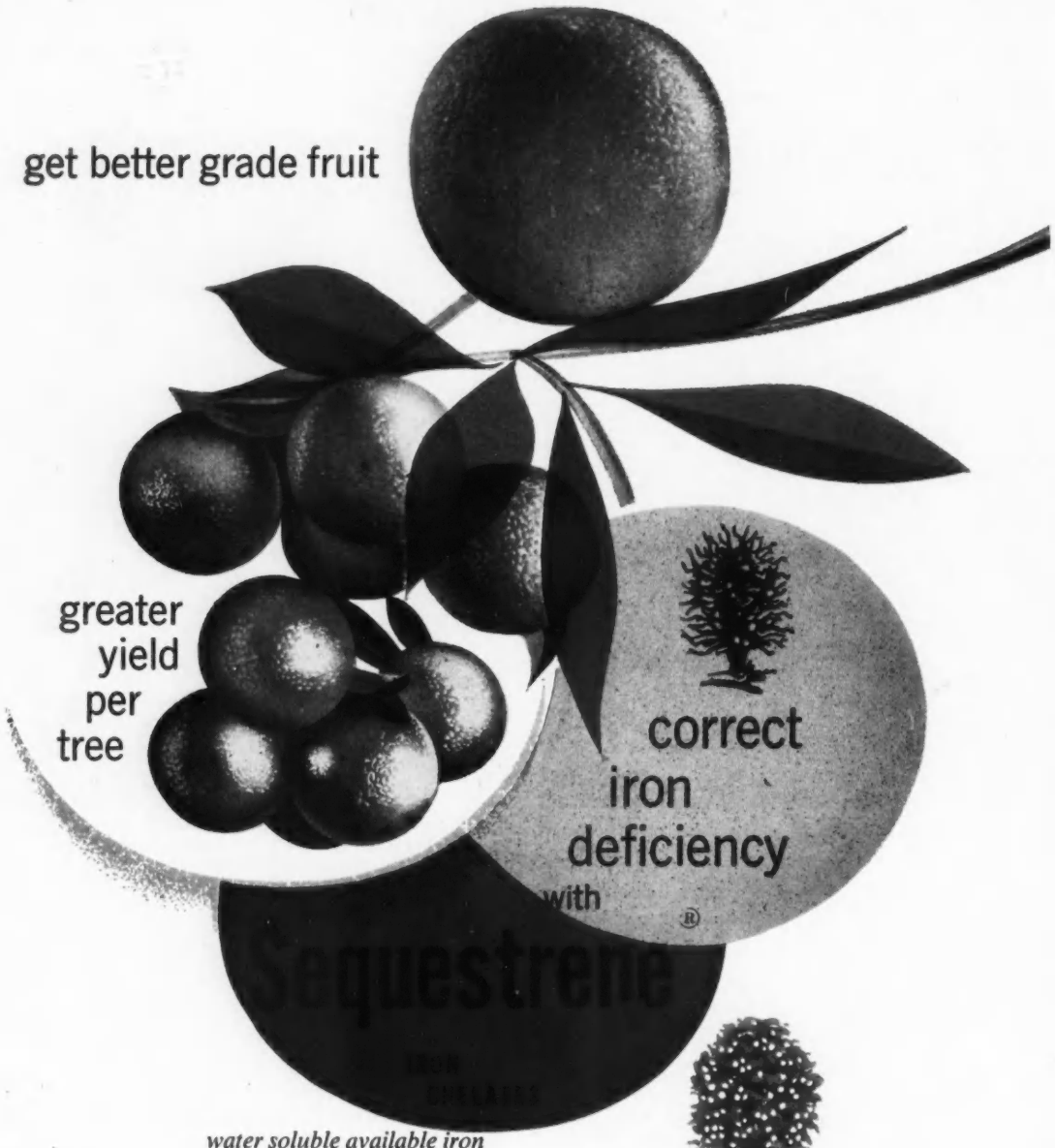

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FINDING THE BEST LEMON FOR FLORIDA . . . A REPORT OF PROGRESS

Continued from Page Three

of December 11-12 had to be abandoned due to rapid breakdown.

After sizing, these fruits were given a Dowicide A-hexamine dip (3) and then waxed with Lake Alfred Wax 101A (5). Storage was in open crates in a constant temperature room at 60° F. (+ or - 1.5°) and approximately 70 per cent relative humidity.

Examinations were at somewhat irregular intervals, partially due to figures so obtained are presented in Tables 1 and 2.

Results

The following selections[2] were not available for fresh fruit studies and hence were not evaluated: Nos. 1, 2, 7, 10, 18, 25, 32, 35, A and B. The following three selections were damaged by the mid-December freeze and could not be cured: Nos. 38, 39, 40.

The first and possibly the most important observation was that many of these lemon selections were obviously capable of being cured to volved, if so some of the losses attributed to **Penicillium** may have

Table 1. Percentage of fungal losses in lemons during curing at 60° F.

Selection No.	Days from picking 30	60	90	Selection No.	Days from picking 30	60	90
3	26.0	35.0	39.5	21	8.5	24.6	35.9
4	19.0	30.0	34.0	22	11.3	27.1	39.1
5	26.4	34.4	43.1	23	0.6	32.3	46.0
6	16.0	38.0	61.0	24	3.7	29.3	51.4
8	12.0	22.0	30.0	26	6.8	26.6	47.6
9	17.0	39.0	53.0	27	11.8	28.5	41.9
11	8.0	23.4	35.4	28	14.0	33.6	49.5
12	10.2	27.5	41.8	29	17.0	30.0	40.0
13	8.1	23.7	34.3	30	9.0	18.6	27.9
14	8.6	25.1	42.1	31	28.0	42.0	52.0
15	11.0	36.0	56.0	33	17.0	31.0	44.0
16	12.1	33.1	51.1	34	10.0	28.3	41.3
17	12.1	24.9	36.1	36	8.6	27.4	46.6
19	5.9	26.7	43.7	37	11.8	27.7	40.8
20	14.5	35.5	51.6				

form an acceptable lemon for fresh fruit use. Some selections retained a greenish ground color, others darkened to an orange yellow, but in contrast there were several selections that colored to an even bright yellow, showed little shrinkage and were of a smooth desirable surface texture.

Losses from decay tended to be rather high, but these lemons had been harvested as cannery fruit with none of the more careful handling that should be part of any fresh fruit harvesting operation. Decayed fruit were removed at each examination and were recorded as being due to stem-end rot or to **Penicilium** mold. Winston and Meckstroth (11) have reported that both **Diplodia** and **Phomopsis** stem-end rots occur in Florida lemons, but no attempt was made to distinguish between these two forms. Moreover since a number of such rots were atypical in appearance, other pathogens may have been inharvesting over a protracted period and partially due to uncertainty as to the potential storage life of these lemons. All data on decay and peel injury were plotted as curves and interpolated values taken for 30, 60 and 90 days from picking. The

[2] For the code used in numbering these selections see Knorr, Part I of this series. April, 1959.

been in reality secondary, rather than primary, infections. Hence Table 1 combines all such losses as "decay" without specifying the causal organism. It is of interest to note that there is little relationship between the amounts of decay observed at the first and at the last examinations. In other words a selection that kept well for the first 30 days would not necessarily be amongst those having the lowest losses at 90 days from picking.

Another form of loss was due to a form of peel injury in which the cuticle remained intact, but the albedo developed small dark sunken areas. This form of blemish appears to correspond to the description of "peteca", a well known, but unexplained market disease of California lemons (6). The amounts of this peel injury are shown in Table 2. It will be noted that not only do the total amounts of this injury vary from zero to over 20 per cent, but also the rate at which it appeared in storage varied considerably.

Considerations of color, texture, shrivelling, shape, etc., are less easily tabulated. For this reason the observations taken relative to these are not presented in detail. Instead lists of the most promising and least promising selections are offered, together with comments on the more outstanding characteristics of each.

The most promising selections, in approximate order of merit, are:

Selection No. & Comments

11 Excellent color, fair textures, comparatively low decay, little peel injury.

8 Excellent color, good texture, decay and peel injury moderate.

22 Very good color, smoothest texture, decay and peel injury moderate.

30[3] Least decay, no peel injury, fair color, fair texture.

23 Decay moderate up to 60 days from picking, peel injury slight, fair color, fair texture. Shape less desirable having a distinct neck.

19 Decay moderate, peel injury slight, fair color, fair texture.

17 Decay moderate, peel injury slight, fair color, fair texture.

21 Decay moderate, peel injury slight, fair color, fair texture.

14 Decay moderate, peel injury slight, fair color, very thin skin.

27 Decay highest of this group, but only slight peel injury, texture fair, color good.

The least promising selections are:

Selection No. & Comments

3 High decay, poor color, shrivelled rapidly.

5 High decay, poor color.

15 High decay, high peel injury.

20 High decay, high peel injury.

28 High decay, off shape, shrivelled rapidly.

[3] Possibly a hybrid, as its oil does not meet U.S.P. specifications for lemon oil. (See paper III of this series. May, 1959.)

Table 2. Percentage of lemons developing peel injury during curing at 60° F.

Selection No.	Days from picking 30	60	90	Selection No.	Days from picking 30	60	90
3	0	2.4	3.4	21	1.4	1.6	1.6
4	0	13.2	19.3	22	0.9	1.2	1.2
5	0	8.5	18.4	23	0	0	0.4
6	0	5.9	6.5	24	3.1	4.9	6.2
8	0	10.0	11.5	26	0	0	3.7
9	0	7.2	8.1	27	0	0	3.7
11	0.5	1.7	2.2	28	0	0	2.6
12	0.2	6.3	6.8	29	0	0	0.3
13	1.9	6.5	6.5	30	0	0	0
14	0.3	4.3	4.3	31	0	0	0
15	3.0	5.0	5.0	33	0	0	0
16	8.0	16.4	20.9	34	0	0	0
17	0	0.9	1.2	36	0	0	0
19	0.2	0.9	2.7	37	3.7	5.5	5.5
20	1.5	4.8	5.3				

16 Fairly high decay, poor color, highest amount of peel injury.

4 Fairly high decay, very radid shrivelling.

37 Off shape, rapid shrivelling, much peel injury.

Several other selections that do not fall in either of these categories merit further comment:

Selection No. & Comments

26 Color and texture good, decay low up to 30 days from picking, thereafter marked down because of rapid increase in decay.

13 Good texture and keeping quality, but color was still dull greenish yellow at 90 days from picking.

33 Fair color and texture, little shrivelling, but high decay. No peel injury. If decay could be controlled this would have been an acceptable fresh fruit.

Discussion

It is apparent from these results that amongst the lemon selections tested here, several were quite suitable for fresh-fruit use if harvested before they were tree ripe and then properly cured. The most promising selections appeared to be the two Bearss selections, Nos. 8 and 11 in this series. Several others also made an acceptable fresh fruit after curing. Moreover, 11 of the 40 selections were not tested as fresh fruit and it is possible that one or more of these might also prove suitable for the fresh-fruit market.

Further research on handling Florida lemons for the fresh-fruit trade is obviously necessary, but the results obtained so far are encouraging enough to suggest that a profitable fresh-fruit outlet might be developed as a sideline when lemons are grown for cannery use. In such a development the lemon groves could be spot-picked for small lemons to be handled specifically as fresh fruit, very much as is done in California. Alternatively, when cannery harvesting methods are not too rough, a presizer might be used to separate out small fruit as was done in this study.

These smaller sizes, properly cured and packed should be able to find profitable outlets, at least in our local markets which at present import lemons from out of State.

Acknowledgements

The author wishes to acknowledge the help of Mr. Frank Cowart and Mr. V. B. Dacy who, as research assistants, participated in this study.

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The Florida Division of Food Machinery and Chemical Corporation announces the appointment of H. N. "Hunt" Ricker as a sales representative for citrus canning equipment.

Mr. Ricker is a graduate of Duke University with a B. A. degree in Economics and also attended the University of North Carolina, Business Graduate School.

Mr. Ricker will make his headquarters at the Lakeland, Florida Offices of F. M. C.

TWO OUTSTANDING STUDENT AWARDS ARE ANNOUNCED

William E. Harris of Vero Beach and James W. Campbell of Plant City have been selected to receive this year's Florida Citrus Mutual awards for outstanding citrus students, Robert W. Rutledge, Mutual general manager, announced on May 6.

Harris was chosen at the University of Florida, while Campbell was the winner at Florida Southern College.

Selections for the awards are made by special committees at each of the colleges on a basis of outstanding work in citrus studies. Each winner will receive a plaque from Mutual which annually makes the award.

Harris, a major in citrus studies, is a senior in the College of Agriculture at the University of Florida.

1958 TUNG NUTS TO BE SUPPORTED AT $53.89

The U. S. Department of Agriculture has announced that prices to growers of 1958-crop tung nuts will be supported by the Commodity Credit Corporation at $53.89 per ton, with an equivalent support of 21 cents per pound for tung oil.

This compares with a support level of $52.13 per ton for tung nuts in 1957 and the equivalent figure for tung oil of 20.5 cents per pound.

The supports reflects 65 per cent of the November 1958 parity price of $82.90 per ton of nuts.

Plant Commission Urges Utmost Caution

Seeking to cut off all avenues along which spreading decline might travel to reach commercial citrus properties, the State Plant Board has cautioned against any carlessness in the use of mobile cultivating and harvesting equipment in decline-infested areas.

Dr. W. G. Cowperthwaite, plant commissioner, has called upon grove owners and caretakers to exericse every precaution in the handling of field equipment in konwn or suspect areas. He explained that evidence has been offered that decline could be transported through the movement of soil adhering to mobile units.

The commissioner pointed out that patterns of decline found in some groves roughly parallel the patterns generally followed in discing those groves.

"It is highly possible that decline could have been moved from an area of infestation into apparently free areas through the movement of equipment," Dr. Cowperthwaite said.

"Scientific papers prepared by state and federal research men indicate that the burrowing nematode responsible for spreading decline can survive excessive heat and dryness. These two conditions generally are present in soil that might cling to tracks, wheels and bodies of units used in cultivating and harvesting citrus acreage."

Dr. Cowperthwaite said that tests at the Citrus Experiment Station conducted by Dr. A. C. Tarjan have indicated that the burrowing nematodes could be transported during the movement of soil by cultivating equipment. In addition, Dr. Julius Feldmesser of the U. S. Department of Agriculture has completed experiments on the limits of temperatures that can be borne by the burrowing nematode without destroying the ability to attack host roots.

"Citrus soil infested with this nematode has been maintained in shallow vessels in direct sunlight for extended periods of time," he declared. "The soil was removed at regular intervals and placed in pots in which were planted nematode-free citrus and corn. The results showed that the burrowing nematode could survive under conditions similar to those that would exist in compacted soil on grove equipment and vehicles."

Recommended to growers and caretakers is a program similar to that followed by the Plant Board in its fight against decline. All equipment used in the push-and-treat operation is thoroughly cleaned before being moved out of an infested area.

"The same sort of precautions by everyone involved in grove care would go far toward containing the nematode responsible for decline," the commissioner stated.

STRESS FAMILY LIFE

Home demonstration clubs in Duval County plan to emphasize family life discussions in the monthly meetings in 1959, it is reported by Mrs. Nellie D. Mills, home agent. Miss Ruth Harris, family life specialist with the Agricultural Extension Service in Tallahassee, recently met with club leaders and helped lay plans for the emphasis.

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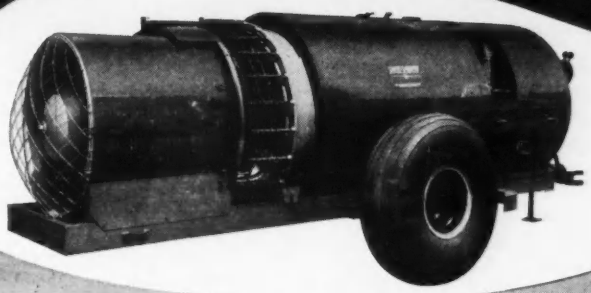

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Finding The Best Lemon For Florida ... A Report Of Progress[1]

V. General Conclusions Regarding The Best Lemon For Florida

By

DR. HERMAN J. REITZ
Florida Citrus Experiment Station, Lake Alfred

Florida's lemon industry, after long dormancy, now shows signs of renewed activity. In recent years substantial acreage of lemons have been established. The reviving industry is markedly different from the industry of 65 years ago, in that the planned market outlet is for processed foods rather than for fresh fruit.

Florida's re-entry into the lemon field may seem to present a paradox when viewed against the national lemon supply picture. California, the source of the nation's lemons for 65 years, even now has difficulty in marketing successfully its present crop, and may face a 25 per cent increase in lemon supply by 1968 (1). How then can growers increasing the lemon production in Florida expect to obtain a profit? The Florida incentive lies solely in the belief that Florida production costs will be appreciably lower than those of other regions. Certainly under such circumstances Florida lemon growers must place themselves in the best possible competitive position.

An item of utmost importance is the choice of variety. The desirable qualities to be possessed by a Florida lemon would include tree characteristics as longevity, freedom from disease, and high yield, and fruit characteristics as high acid content, high juice content, good lemon flavor, and a high quality peel oil in good yield. Only secondarily would fresh fruit quality be a factor. Never before have lemons been selected for these characteristics.

The choice of a lemon variety to plant today is a perplexing problem. The industry is not fortunate enough to have any variety or strain comparisons in an advanced stage of development. Such trials were begun only recently, following revival of interest in lemons for Florida. Only one of the trial plantings has come into bearing, and from it has been obtained the data, primarily on fruit characteristics, presented in Parts I to IV of this series. This information is not a complete evaluation of strains. A most obvious deficiency is the lack of yield data. Also, only 42 of over 200 strains under comparison have been evaluated. Several more years will elapse before these data are available. In the interim, many lemon trees may be planted. This series of papers has been presented in order that growers may have the benefit of all currently available information, incomplete though it may be.

The presentation of this information marks an important first step toward selecting the best lemon for Florida. The data on processing and oil extraction are thought to be relatively reliable even though obtained in a single year. Oil quality and juice characteristics are not expected to vary markedly, although some season to season fluctuation may occur.

Horticultural and pathological investigations progress more slowly than other aspects of variety selection, and hence are at a lower stage of development at present. Observations of the parent trees and of the topworked trees in the Avon Park planting have shown an important degree of variation in thorniness, cold intolerance, and susceptibility to scab and to russeting. Also many Florida lemons are found susceptible to a condition tentatively designated "rumple". These factors are of little significance to the quality of the processed product, but have a distinct bearing on production and picking costs. The choice if possible should be made among lemons less subject to these undesirable characteristics.

Only the most preliminary notion of yields can be obtained from the available data. There are indications of wide variation in yield among selections, emphasing the importance and need of carefully conducted replicated trials to obtain yield comparisons.

An encouraging point brought out in the processing studies was the general absence of undesirable flavors in the frozen concentrates for lemonade. One selection, Meyer, made an undesirable pack when its own oil was used in the product; however, even Meyer juice made an acceptable product when certain precautions were taken, including the addition of good quality lemon oil from another source. This development simplifies the choice of lemon appreciably, assuming sufficient quantity of good quality lemon oil to be available. Fruits of most selections gave satisfactory yields of high acid juice.

One of the most significant points discovered in this work is that several lemon selections evaluated contained oil of exceptional quality. Selections 8, 11, 21, 26, 27, and B, and some others were sources of oils possessing excellent qualities. Some of these oils were superior to any domestic oils now being produced. By contrast, several selections did not yield oils even of minimum U.S.P. standards. Thus, growers face an opportunity to choose a lemon that has very substantial value for its oil alone, and face as well a hazard in choosing a lemon with essentially no oil value. With the present value of domestic lemon oil

Continued on page nineteen

1. Florida Agricultural Experiment Station Journal Series No. 820. Presented at Florida State Horticultural Society Meeting in Clearwater, October, 1958.

Mrs. M. L. DuFrene (left) discusses the excellent quality of her oranges with Rainbow representative B. E. Pennington (center) and James Stenholm, manager of the DuFrene grove.

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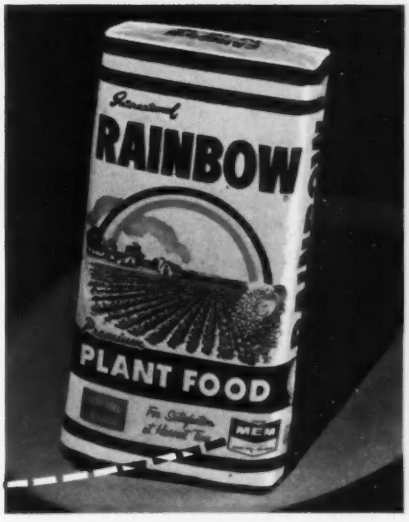

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Microbiological And Sanitary Aspects of Mfg. Citrus Products*

. . . By . . .
V. S. TROY AND
A. M. SCHENCK
Metal Division Research & Development Department Continental Can Co., Inc., Chicago.

The food processing industries have long recognized that sanitation and cleanliness are important to profitable operation. In the citrus processing industry they are critical, as preservation of the product is contingent upon protection against contamination by spoilage microoganisms. The citrus processor knows that the cost of maintaining the finshed quality of his food product is directly dependent upon the initial quality of the raw product; thus he usually purchases the entire crop from the grove and harvests the fruit with company-controlled picking crews. In this way, his quality program begins in the field.

Large trailer trucks deliver the fruit to the plant's receiving station. Roller elevators convey the fruit to the pre-graders where it is inspected visually for soundness and maturity. Samples of each incoming lot are also taken by automatic sampling devices at pre-determined intervals for detailed laboratory analysis. The standard maturity tests for citrus fruits, as regulated by state laws, are based on the Brix-acid ratios and on minimum Brix readings. Murdock and Brokaw (23) recently made a detailed study of each fruit handling operation to determine its effect on fruit surface contaimination. Their data show a correlation between fruit quality and the microbial load of extracted juice, and that initial sanitizing operations are minimized or nullified if subsequent fruit handling equipment is not kept in a sanitary condition.

Each load of fruit received at the plant is generally stored separately in expanded metal bins to help control blending of fruit to obtain optimum quality. Perodically, the receiving ramp, pit, and roller elevators are washed down with a high pressure hose and all damaged fruit is removed. Insecticide sprays are often required to control fruit flies while the fruit is in storage. In a few instances, the fruit is washed and sanitized prior to bin storage.

Belt conveyors carry the fruit from the storage bins to a brush-spray washer using a properly balanced alkaline detergent, the concentration of which is automatically controlled. Usually all belt conveyors in citrus processing operations are maintained under a constant chlorinated water rinse with a residual of about 15 ppm. Maintenance of detergent concentration is extremely important, as corroborated by the work of Murdock and Brokaw (22) and earlier by Beisel. (4) These researchers showed that maintenance of detergent concentration was more essential to fruit washing than control of the accumulated total solids in the washer.

High pressure water rinses the fruit while it is conveyed to the "shampoo-washer" or sudser. Here the fruit is "shampooed" with a near neutral wetting agent detergent. The brush-spray washer and sudser are completely cleaned and sanitized after each 8-hour shift, or sooner if deemed necessary. The fruit is then subjected to a series of clear water rinses followed by a germicide rinse using chlorinated water. Studies (20) have shown that spray rinsing the fruit with chlorinated water in the range of 20-25 ppm can result in 98% reduction in surface contamination.

The fruit is automatically graded according to size and moves along inspection belts where final inspection of the fruit is made before the juice is extracted. The rollers, conveyors, chutes, and floor are periodically rinsed with a high pressure hose. The sorting rollers and conveyor belts are then steam cleaned followed by a thorough rinse with clear water.

The juice is usually extracted by either "in-line" or rotary extractors. Periodically the extractors are rinsed completely with a high pressure hose; peel chutes and juice troughs are removed, and the equipment is then rerinsed.

After extraction, the juice is run through multi-stage juice finisher units to remove pulp, seed, and rag, and into the feeding tanks for the evaporators. Immediately after shut-down, the finishers are cleaned thoroughly. The finisher cover, screen and juice trough cover are removed, rerinsed with a high pressure hose and then steam cleaned followed by a fresh water rinse. The feeding tanks are drained and rinsed thoroughly. The inside and outside are scrubbed using a brush and warm water cleaning solution. The tanks are sanitized by spraying with a 300 ppm solution of sodium hypochlorite which is allowed to remain in contact with the equipment for at least 15 minutes before rinsing with clear water.

The juice to be concentrated is heat stabilized at this point or during the early stages in the evaporation cycle. This heat treatment not only inactiviates most of the pectic enzymes, improving stability of the concentrate during storage (12), but may also reduce the bacterial population by 80-99%. (24) However, unless the heat exchangers are kept in a sanitary condition, they may actually be a source of bacterial contamination. During periods of bacterial build-up in a plate type heat exchanger, Murdock, Brokaw, and Allen (24) observed that the microflora of stabilized juice differed from those of unheated juice: The colonies before heat treatment were predominantly gum formers whereas those after stabilizing were principally pinpoint colonies. J. M. Berry of our laboratory isolated and identified the contaminating organisms as a heterofermentative lactobacillus capable of growing over a wide temperature range. Optimum conditions for growth of the organism in orange juice were in the range of 12° and 20° Brix at temperatures between 110° and 120° F. To control or prevent this type of contamination, these authors suggest eliminating any regenerative or cooling section of the heat exchange operating in

*Based on a paper presented at the International Association of Milk and Food Sanitarians Meeting in New York City, September 10, 1958.

the critical temperature range, and flashing the juice directly into the next stage of evaporation; cleaning the stabliizer thoroughly every 4-6 hours; cooling the juice after heating to a temperature above the growth range of the organism; and stabilizing the juice above 30° Brix at a high enough temperature to obtain 100% destruction of all bacterial cells present in the juice. (24)

The juice is pumped from the feeding tanks to high vacuum—low temperature evaporators where the juice is concentrated to the proper degree Brix and up to 75% of the water may be removed. Immediately after shut-down, the evaporators are rinsed thoroughly and a warm cleaning solution is circulated for 30-45 minutes. Vacuum is released, the top opened, and the unit rinsed with cold water. The entire unit is visually inspected and brush-washing or steam cleaning accomplished where necessary. The unit is rinsed again and then closed. A 300 ppm sodium hypochlorite solution is circulated through the evaporator for 15 minutes, drained, and then rinsed with fresh water. In-place cleaning by means of strategically placed spray heads is also now employed for rapid cleaning of evaporators. (21)

After the juice is concentrated to the desired Brix, it is pumped to blending or standardization tanks where the concentrate is "cut-back" or mixed with fresh juice to provide some of the volatile constituents which were lost during evaporation. From the standardization tanks, the juice may go to the votator which continuously slush freezes the concentrate prior to filling; or, the juice may go directly to the filler after blending.

Immediately after shut-down, the filler is rinsed with a high pressure hose and then steam cleaned and rinsed with warm (125° F.) water. The filler is sanitized by spraying with a 300 ppm solution of sodium hypochlorite, allowing 15 minutes contact time. The unit is then rinsed with clear water.

Filled cans of concentrate are then closed and frozen by immersion freezing or by air blast. The cans are cartoned and placed in cold storage at 0° to -10° F. Even though concentrates are stored at these low temperatures, certain organisms and yeasts from improper sanitation can have an adverse effect on the keeping qualities of the frozen concentrate, emphasizing the importance of an adequate and effective plant sanitation program.

Bacteriological Problems

Frozen orange concentrates and chilled orange juices are nonsterile acid (pH 3.4-4.1) products having a selective microflora. (1, 2, 10, 11, 15, 29) Early in the industry's history, considerable time was devoted to the study of the coliform bacteria, (particularly by the sub-committee on Microbiology of the I.F.T. Committee on Citrus Products) the fecal streptococci, and Clostridium perfringens to determine their relationship to sanitary control in the citrus products industry. It was concluded (5, 10) that the inescapable ubiquitousness of the coliform bacteria in the environment associated with the growing and processing of this particular food product—despite judicious care in handling and processing—invalidates standard coliform test results, as corroborated by Wolford. (29) Hunter concluded that determination of the presence of coliform organisms serves a very useful purpose only when there has been sufficient study of the production and handling methods of the class of food product under control to lay the basis for interpretation of the significance of members of the coliform group as a whole or of genera or species within the group. (18) Although a positive presumptive test (5) may indicate the presence of coliforms, it should be noted that naturally occurring yeast in orange juice ferment the lactose used in the conventional medium, creating an undue number of false presumptives. Special screening media have been devised to minimize the incidence of these false readings. (3)

Studies conducted in our laboratory with strains of E. coli of fecal origin experimentally inoculated into 42° Brix orange concentrate and stored at 0° to -10° F remain viable for at least 12 months; however, when inoculated into 42° Brix concentrate and held at room temperature, they died rapidly. An initial count of 58 million per ml showed 30% survivors after 30 minutes; 8% after 48 hours; 1% after 72 hours, and no survivors after 96 hours. Thus it appears that the coliform bacteria are of no public health significance in evaluating the sanitary quality of frozen citrus concentrates, an opinion substantiated by Dr. G. M. Dack. (10)

Since coliform bacteria or enteric organisims as a group have not been shown to be important indicators of sanitation in citrus products and since there is no apparent public health hazard of bacterial origin, microorganisms capable of growing in single strength juice and low degree Brix concentrate are the most important indices of sanitation in the control of high quality frozen citrus products. (27) These include lactic acid and acetic acid bacteria, yeasts, and molds. (26) Since yeasts and molds do not grow rapidly enough to cause spoilage under conditions normally prevailing during vacuum concentration of the juices (27), they will not be covered further. The lactic acid and acetic acid bacteria—nonsporeforming organisms having a low heat resistance — grow rapidly in the single strength juice. Therefore, any point in the handling of the single strength juice or in the low Brix stages of evaporation may provide favorable conditions for the growth of spoilage microorganisms, particularly lactic acid bacteria, if the surfaces of the equipment are not kept clean. (25) Concomitant with the growth of these organisms is the production of diacetyl, which has been reported to be partially responsible for the undesirable buttermilk to sauerkraut-like off-flavors and odors in frozen orange concentrate. (6, 7, 8, 15, 16, 17)

Quality Control

Quality control in citrus processing operations covers two broad categories: product and process control and sanitation control of equipment, facilities, etc. The quality control laboratory uses a variety of analytical methods and procedures.

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FOVEA — A DISEASE OF CONCERN TO MURCOTT GROWERS

Continued from page seven

fection else they would be dead today and all subsequent Murcott plantings would be diseased. A likely explanation for the occurrence and spread of fovea is that some nurseryman, eager to produce abundant budwood, topworked Murcott into xyloporosis-infected but xyloporosis-tolerant trees (e.g., grapefruit trees on rough lemon or sweet-orange trees on Cleopatra mandarin). Such topworking (an example of which is shown in Figure 5) produces abundant budwood before symptoms of fovea disease appear in the tops.

The susceptibility to fovea resides in the Murcott portion of the tree and not in the rootstock—unless possibly sweet lemon or sweet lime is used. The virus, too, is contributed by the Murcott, and not by the rootstock seedling—unless the seedling has previously been budded with virus-containing budwood.

Control

In the light of what has been said above, the means for avoiding fovea would consist of the following 5 recommendations:

1. Murcott budwood should not be taken from topworked trees. Such trees are questionable sources because a) virus may have been introduced by the sandwich variety, or b) because infected Murcott buds may have been used in topworking, and topworking may delay appearance of the symptoms.

2. Seedling rootstocks should not be used for propagating Murcott if such seedlings have been budded previously. The original budding may have introduced the virus; infection may take place even though buds subsequently fail to live.

3. The growing of Murcotts by topworking other varieties will result in failure if the original trees contain the causal virus. Even if the virus exists in the trees before topworking, such trees will not show symptoms if they consist of tolerant varieties. However, when topworked to Murcott, symptoms develop in the susceptible Murcott, and the top declines.

4. Infected Murcott trees, even though symptomless for the time being, can be recognized by indexing them into susceptible indicator varieties and awaiting development of symptoms—a process that takes up to 4 years to complete. Since it is impracticable for each nurseryman to undertake his own screening procedure, testing is being done through the Budwood Registration Program of the State Plant Board of Florida. Unfortunately, for purposes of the present expansion, only one parent Murcott tree free of xyloporosis virus (the causal agent probably involved in fovea) is currently represented in the Program.

5. Failing the availability of virus-free budwood through the Registration Program, the second best procedure is to obtain budwood from healthy-appearing Murcott trees, the tops of which are 12 years old or more—the older the better.

According to latest figures available, there are approximately 258,000 Murcott trees in Florida. A certain percentage of these, especially of the trees planted during the current expansion, can be expected to show fovea. While there is no cure for trees that develop symptoms (other than to replace them when they cease to be productive), it is hoped that the above information will at least make it possible for growers to avoid this disease in future.

Figure 6. — One of the original Murcott trees as it looks today, illustrating by its healthy condition, the fact that this variety is not universally infected by the virus causing fovea. This tree, planted in 1922 by Charles Murcott Smith (after whose mother's maiden name the variety is called), stands at Bayview, in Pinellas County. (Photographed through the courstey of Mr. Philip C. Morse, Jr., Florida Tangerine Cooperative, Lakeland, Florida.)

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MICROBIOLOGICAL AND SANITARY ASPECTS OF MFG. CITRUS PRODUCTS

Continued from Page Fifteen

Among the bacteriological control procedures are microscopic counts, total plate counts, and the diacetyl test. Plate counting on orange serum agar (pH 5.5) is the traditional method used by concentrate processors for obtaining bacteriological counts on fluid products. Phase contrast microscopic counts are also made. The most popular method is examination of a stained film of dried juice under a high-powered oil immersion objective. (19) The direct microscopic count is still believed to be the best technique although a variety of successful methods are now in use.

Analysis for diacetyl, an indication of microoganism build-up, is proving an extremely valuable inspection tool. (9) It can be detected by chemical tests long before it produces an off-flavor detectable by taste. Analysis for diacetyl thus provides an effective quality control tool as well as sanitation index.

Kilburn and Tuthill (19) reported that hanging conditions in a concentrate plant can be interpreted more readily by determination of growth rate of microorganisms than by population level. The number of microorganisms present and the length of time of plant operation are plotted on a semi-log scale. The slope of the line obtained gives the rate at which the plant approaches an unsafe level and it can be cleaned up before there is any danger of spoilage.

Single strength chilled orange juice—a nonsterile product—is now being marketed in much the same manner as milk. Due to the high acidity of the product, a mild heat treatment is all that is required to reduce enzymatic and bacteriological action and extend the palatable shelf life for more than 10 days, provided it is kept under refrigeration. After preparing the orange juice, the remaining handling is much the same as the handling and packaging of milk. Usually commercial milk - filling machines are used and the chilling and packaging of the juice follows standard dairy practice. The juice is chilled to just above the freezing point in most cases before it is filled into the carton. Since problems related to the production and distribution of cartoned orange juice were covered recently in a series of articles by D. O. Hamrick (13) they need not be repeated here. However, one of the more important items to consider in marketing chilled orange juice is the method of distribution from the point of production to the ultimate consumer. (14) The elasped time between production and consumption, as well as the storage temperatures during that interval, can mean the difference between a product which meets a high consumer acceptance and one which will cause an adverse consumer reaction.

Summary

That sanitation plays a vital role in controlling the quality of citrus products is substantiated by the exceptionally high sanitary standards maintained by the industry. Continuous application of up-to-date methods and tenchniques, followed by proper utilization of the information in formulating an adequate, effective sanitation program has proved effective in microbiological control, virtually eliminating spoilage problems.

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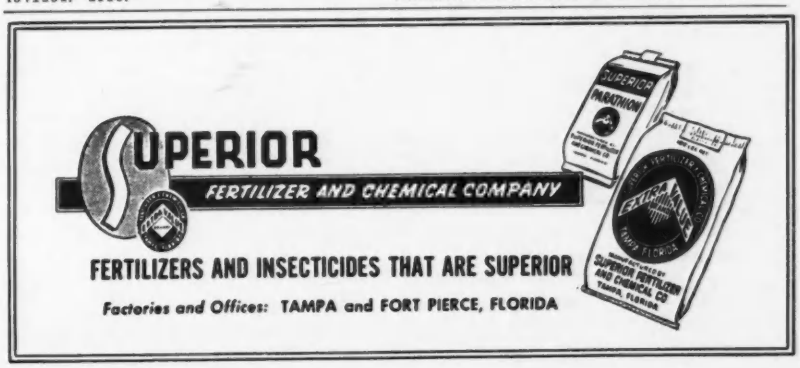


From Pedersen's Weekly News Letter

Citrus Prospects

Many growers are puzzled over the recent strength of the citrus market. Both fruit for fresh shipment and fruit to be processed have advanced the past few weeks with apparent little change in the Government estimate, quality, or amount consumed by the public. Our recent Government estimate added 1,000,000 boxes of Valencias to this year's crop, but deducted 900,000 boxes of Early and Mid-Season varieties, which leaves the estimate almost the same as it was.

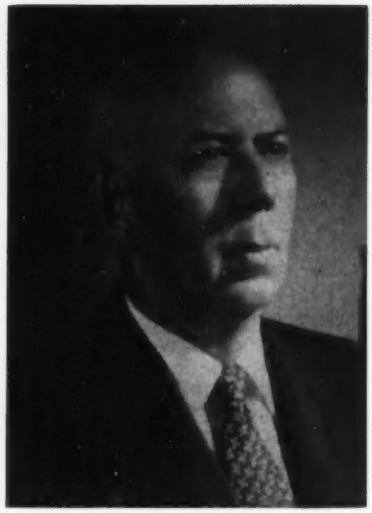
The prospects for our next year's crop seem to have influenced and strengthened the market. It was not many years ago that each season stood by itself, but since the advent of canning and freezing, our seasons overlap and level out the production of high and low years. Recently the volume of Florida oranges shipped in the fresh form has greatly decreased, due to the fact that shippers have had to quote prices high enough to equal those paid to growers by processors.

Formerly the price of Florida fresh oranges set the price of processing oranges, but not anymore. Our Florida fresh orange volume has been steadily reduced this year to get the supply low enough to create a demand that would justify the high prices paid for oranges by processors.

For many weeks California citrus people have sold a large volume of their fresh oranges in the markets at prices considerably under Florida's. This has rarely happened in the past, and it all adds up to the fact that Florida's fresh orange shipments have been high priced and California felt they could accept a smaller price on the fresh market because they had a large volume of Navels to be shipped and practically only a fresh market to sell them in.

Two months ago citrus growers were looking forward to the heavy bloom on the trees at that time producing a heavy citrus crop for next year. Today fruit men are predicting that we will have a lighter crop than we have the past season on some varieties, and that prices will be high again next year.

It is very unusual for buyers to purchase fruit this early in the season for the following year, but crops have already been sold to be delivered next year. All this optimism could disappear very readily if our citrus trees would throw out a heavy June next month, but most fruit men do not look for this because of the abundance of rainfall this spring.



W. C. PEDERSEN
President Waverly Growers Cooperative

Our cannery, like other canneries, has an inventory running into many hundreds of thousands of cases of canned and frozen citrus products. It is very important for us to have some idea of what we can expect in the way of fruit supplies from our members. It is very difficult to estimate next year's crop this early in the season when the fruit is so small and green. Many hazards might present themselves before it could be picked.

We have asked each member of our cannery to give us as accurate an estimate as possible of how they would expect their volume next year to compare with what has been picked this year. These estimates have been received, the volume of fruit from different members added up, and the totals worked out in percentages in order to arrive at a final figure for our cannery. The following are the expected percentages:

Seeded grapefruit - 50% of 1958-59 harvest

Seedless grapefruit - 75% of 1958-59 harvest

Pink & Red grapefruit - 75% of 1958-59 harvest

Early oranges - 80% of 1958-59 harvest

Midseason oranges - 75% of 1958-59 harvest

Valencia oranges - 100% (or more) 1958-59 harvest

Temple oranges - 100% of 1958-59 harvest

Tangerines - 75% of 1958-59 harvest

I feel, personally, that these figures are a little low on some varieties and that we probably can expect to have more fruit than they indicate.

It is very difficult to get any figures from California because their blooming season is almost two months later than ours, and we know how difficult it is to get figures from Florida even at this later date. We have interviewed a very prominent California citrus man and he is of the opinion that their Navel crop will be ten to fifteen per cent less than last year's production, and their Valencias will also be somewhat less, but it is too early to tell at this time.

Word also comes from Texas that they are disappointed in the set of their crop. They fully expected a very large crop of fruit this coming year . . . in fact, the biggest crop since their big freeze. They blame the prospects for their reduced tonnage on the fact that rain during the blooming period did not let the fruit pollinate.

Another Texas grower advises that even fruit that did set is falling from the trees. One man feels that we might expect to see Texas ship 30% more than they shipped last year. Another feels that their tonnage will only be slightly higher. As Texas shipped a total of about 6½ or 7 million boxes, about the most we could expect the coming year would be additional 2 million boxes.

If our figures are anywhere near correct, it now looks as if the U. S. citrus crop will be reduced by several million boxes next year. Of course, this is only a wild guess and there are many things that might influence additional tonnage or decrease the tonnage between now and the time of harvesting. One thing is sure . . . the prospects for next year have strengthened the orange market at this time.

Sixth Annual South Florida Citrus Institute

The 6th annual South Florida Citrus Institute was held this month on June 3 and 4 at the 4-H camp Cloverleaf, Lake Placid, Florida.

Fred P. Lawrence, citriculruist of the Agricultural Extension Service, of the University of Florida was in charge of the meeting.

Papers dealing with the Producing and Delivering of Top Quality Fruit; Greasy Spot Disease and Its Control; the Plant Board's Citrus Programs; and Melanose—Its Importance and Control were presented to those present on the morning of June 3rd.

Jack T. McCown, assistant citriculturist, Agricultural Extension Service, presided at the afternoon session when other papers dealing with citrus were presented.

The subjects covered were: What Kind Of a Job Are We Doing?: The Summer and Fall Insect Situation; New Spray Materials; and A Look Into the Future.

William H. Matthews, assistant horticulturist of the University Extension service presided over the morning session on June 4th. The following papers were presented: The California Citrus Industry, As I Know It; The Florida Budwood Program - What's In It For The Grower; Are Registered Trees Available?; and Fertilizng For Quality.

Continued on Next Page

FINDING THE BEST LEMON FOR FLORIDA . . . A REPORT OF PROGRESS

Continued from page twelve

equivalent to $1 per box, such an opportunity should not be overlooked.

A second point concerning lemon oil substantiated in the work is that methods of extraction can influence quality. Regardless of natural quality of oil in the peel, high quality can be lost by improper processing procedures, such as use of high proportion of processing water to oil obtained. Regardless of variety, these factors must be recognized.

Fresh fruit possibilities merit some consideration. The packinghouse work demonstrated that certain Florida lemons would make a satisfactory fresh-fruit pack. The main questions lie in the marketing field. Certainly large sizes, and high decay losses make impractical serious competition in the United States market. There does seem a distinct possibility, however, of marketing a worthwhile volume of Florida lemons in Florida and neighboring states as an adjunct to the processing operation. Such operations would require either some special arrangements to obtain the small lemons from the processing plant or spot picking of small fruit possibly on a contract basis. Special packinghouse and marketing efforts would be necessary. In a small way, supplying fresh lemons to the Florida market could become a profitable specialty. The data presented in Part IV show that some selections of lemons are more suitable than others for fresh fruit use.

An interesting feature of the data was the failure of selections tentatively designated as Lisbon or Eureka to be superior in any respect. These varieties, if they are in fact properly identified, are standard in California. They were originally selected with the fresh fruit industry in mind and for a rather dry climate, neither situation being of importance in Florida. The lack of outstanding performance of these varieties in this study may raise a question as to whether the apparently virus-free nucellar strains of these varieties would any better serve Florida's purpose.

The preceding papers have presented lists of lemon selections showing their relative desirability from various standpoints. Growers would be well advised to avoid planting selections appearing unfavorably in these lists. Fortunately, there are several selections which are desirable in many respects, and from these the grower should make his selection pending availability of more information.

In conclusion, this work has demonstrated the diversity of lemons now present in Florida. Among the selections tested there exist many that are distinctly inferior and a few, apparently, that are superior. Information presented in this series should help growers to avoid at least some of the poorer selections.

Screening of the more than 200 selections now in the lemon project will continue, and further reports of progress will be issued when justified by the availability of data.

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Soil Science Foundation Holds 20th Annual Meeting

The 20th annual meeting of the Soil Science Foundation was held in Lakeland, Wednesday, April 20th.

Originally the Society was known as the Soil Science Cooperative, but for the past 13 years it has operated as the Soil Science Foundation.

During the luncheon held at the Glass Diner, tribute was paid to the charter members and directors of the organization and to its first secretary-treasurer, Mrs. Elsie Horton Lane, Haines City.

Three new directors were elected at this meeting: Fred D. Yancey, Jr., Umatilla; R. L. Bryan of Bartow and Chester Karst of Orlando. They will serve for three year terms.

The organization reported that it had been doing research work in the fundamentals of plant nutrition and soils, and President Arch R. Updike, Jr., announced plans for the new research grove on semi-flatwoods land near Duette in Manatee county, which they hope will serve as a guide to growers who plan to develop groves on this type of land.

Dr. Bryan, director of the foundation, discussed some of the significant trends developed from fertilizer and soil amendment treatments in the Short research grove near Clermont.

This pineapple grove planted in February 1939 on Lakeland sand is divided into experimental blocks under varying treatments by the Foundation for the past 17 years. Reference was made to the experimental work with the Shandy research grove at Lake Garfield Nurseries. This study started in 1953, is with Valencia oranges on Lakeland sand near Lake Garfield.

Soil Science foundation technician Harold Guilford gave a report on the recovery of cold damaged trees following different fertilizer and minor nutrient treatments.

About 80 members and their friends attended the meeting.

SIXTH ANNUAL SOUTH FLA. CITRUS INSTITUTE

Continued from Preceding Page

In the afternoon session James E. Brogden, entomologist of the University Extension Service, presided, and the following subjects were covered in papers presented: Some Additional Information on the Burrowing Nematode; My Experience in Growing Citrus on Poorly Drained Soils, by A. R. Jones, Vero Beach, was followed by a panel discussion dealing with this same subject.

Each of the papers was presented by a member of the various state citrus services who are widely recognized for their knowledge and experience on the subjects they discussed.

Industry Research Plans

Florida Citrus Foundation Plans Are Announced

Key representatives of Florida's multi-million dollar citrus industry here plans to organize the Florida Citrus Research Foundation to sponsor cultural and scientific efforts to improve the quality of citrus grown in the state.

The group, composed of all factors in the state's citrus industry including Florida Citrus Mutual and Florida Citrus Exchange, expects to raise $200,000 from voluntary contributions within the industry to establish the Foundation.

The principal original aim of the Foundation is to purchase a 500-acre tract of citrus land near Leesburg on which to conduct research and experiments in scientific plant breeding to produce the best possible citrus varieties. The tract would be leased to the U. S. Department of agriculture and the State Plant Board which would be in charge of the research and experiments.

Al Whitmore, Orlando, general manager of the Florida Citrus Production Credit Assn., has been named president of the Foundation. Named to serve with him on the Foundation's "interim" board of trustees are Marvin H. Walker, Lake Wales, vice president and treasurer; John T. Leslie, Tampa, second vice president; Herman F. Steel, Lakeland, secretary; and trustees are G. D. Sloan, Tampa; J. R. Graves, Vero Beach; Wilbur Charles, Winter Haven; James C. Morton, Waverly; C. F. Fawsett, Jr., Orlando; A. V. Saurman, Clearwater; and R. G. Pitman, Apopka. Legal counsel are Counts Johnson, Tampa and J. Hardin Peterson, Sr., Lakeland.

Research Advisory Committee Named By Commission

General Manager Homer E. Hooks of the Florida Citrus Commission today described a newly-appointed Industry Research Advisory Committee as a "blue ribbon" panel whose purpose is to appraise existing research projects and suggest new or additional ones.

The Committee, already referred to as IRAC, was appointed by Commission Chairman J. R. Graves Wednesday during the Commission's regular monthly meeting.

Hooks said the Committee would advise the Commission on research projects for the citrus industry and suggest new fields where more intensive research activity may be indicated. He said it would also make recommendations for enlarging or accelerating existing programs.

Appointed to IRAC were Marvin H. Walker, Florida Citrus Canners Cooperative, Lake Wales, chairman; Sen. Ed. Price, Tropicana Products, Inc., Bradenton; A. V. Saurman, Pinellas Growers Association, Clearwater; Robert C. Wooten, Pasco Packing Company, Dade City; W. L. Story, Certi-Fine Fruit Company, Ocoee; John T. Lesley, Florida Citrus Exchange, Tampa; and Howard Thullbery, Superior Fertilizer Company, Tampa.

Florida harvests more than half a million arces of corn annually. The high was reached in 1946 with 649,000 acres; and the low in 1957 when 557,000 acres were harvested.

Pineapple & Valencias

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Reliable Service — Fair Prices
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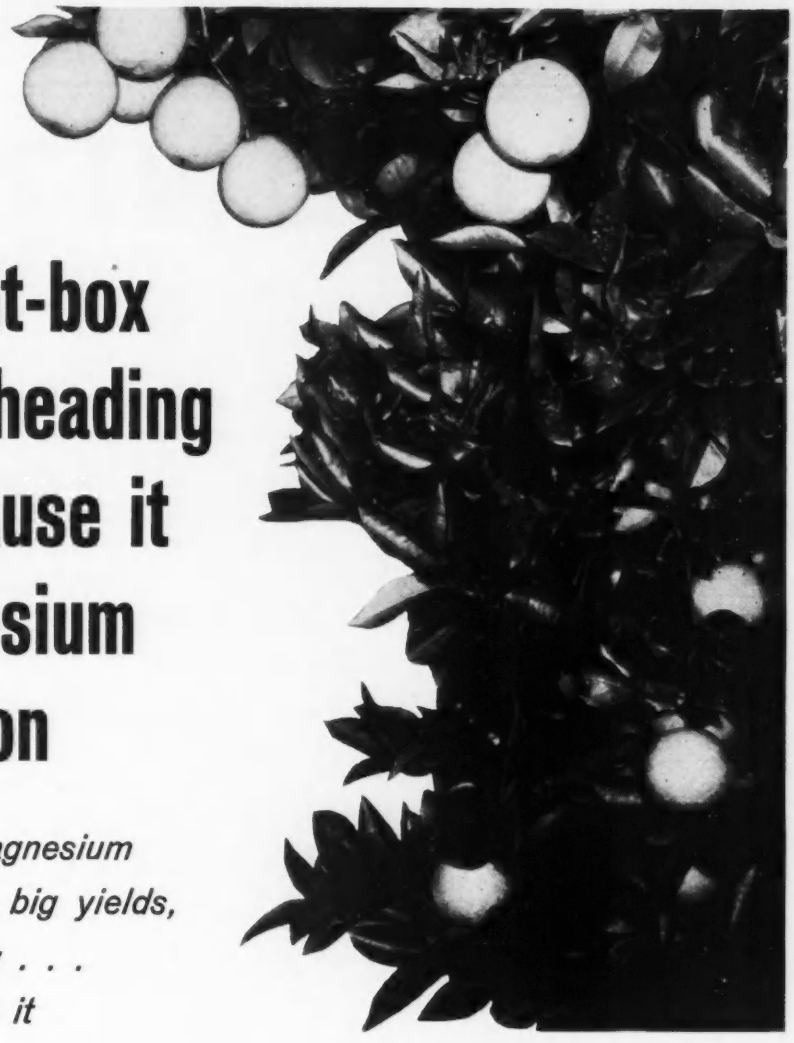

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If the supply of water-soluble magnesium is not maintained, trees lose resistance to freeze, leaving them susceptible to severe winter damage. Leaves turn yellow and drop prematurely . . . leaving stunted fruit exposed to the sun. Trees also lose yield. Fruit size and quality drop. But the big danger is that magnesium deficiency can hurt profits *for years* before any tell-tale yellowing of the leaves signals the cause of the trouble.

The best way to safeguard your crops against magnesium deficiency is with annual applications of mixed fertilizers with Sul-Po-Mag*, also known as SPM. Sul-Po-Mag is water-soluble and fast-acting . . . yet its granular form assures season-long release. And Sul-Po-Mag can be included in the fertilizer ratio you need. It is neutral in reaction . . . . does not change soil pH.

You can get Sul-Po-Mag in most brands of complete fertilizers. For more complete information about the role of Sul-Po-Mag in plant nutrition, write c/o the address below.

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Reports Of Our Field Men . . .

SOUTH HILLSBOROUGH, MANATEE AND SARASOTA COUNTIES

Eaves Allison
P. O. Box 365, Sarasota, Fla.
Phone Fulton 8-2611

At this time - May 13th - there is still no sign of a bloom in this area on those pineapples and grapefruit that passed up their regular early bloom. Guess it will turn out to be a June bloom after all. Groves are looking good otherwise, and the young plantings are flurishing. Fruit is sizing up well - altho much lemon scab is evident on many grapefruit blocks.

Scale seems to be on the decline in this area with rust mite just above normal, or less. The spider mites have not been too much in evidence in this section up till now.

So far this has been a 'vintage year' in the tomato business. Quality has been excellent and the tonnage is there. Prices have been on the satisfactory side and if weather permits the crops will pick well into June. And that won't make anyone mad!

That good Lyons fertilizer is sizing up the citrus crop, and carrying those heavy tomato yields through in a breeze.

NORTH CENTRAL FLORIDA

L. D. Geiger, Jr.,
Phone STATE 7-3952
Leesburg, Fla.

In north central Florida many of the watermelon growers will be able to begin cutting melons around the last few days in May. Many of the melon growers were suffering from lack of water but the recent rain will help some growers very much.

In the Sumter County and the Sanford area the farmers are busy as most of them are picking pepper, beans, cucumbers, etc. In most cases this recent rain helped them also.

On the citrus scene there is still some activity as some growers are still spraying but most growers are getting some of the cultivation done and preparing to start with the summer fertilizer application.

HILLSBOROUGH PASCO AND SUMTER COUNTIES

C. W. Dean
Gibsonton, Fla.
Phone Tampa 40-2592

All groves are beginning to look better. The weather has settled down to a normal pace. The nights have begin to warm up. The groves are showing this by putting on growth with an occasional bloom.

Growers have begun to fertilize their groves with a heavier application than usual.

Truck farmers have found the markets very much to their liking as most all commodities are bringing a very good price. The crops are light due to the heavy rains we had some weeks back. Quiet a few of the farmers' crops were wiped out entirely by all this rain.

Some of the citrus growers have been approached by fruit buyers for their fruit for next season and some have sold already. I hear the prices offered are high.

I'm hoping you growers will have a prosperous citrus season. Try our Lyons Fertilizer and you can have a high yield with high quality fruit. If you haven't tried it, try some today.

HIGHLANDS AND POLK COUNTIES

R. E. Lassiter, Jr.,
P. O. Box 1304
Winter Haven, Fla.

Rain-fall has slacked off somewhat in this area in the past few weeks. However, at the time of this writing, we are beginning to receive some good showers which should help greatly in holding off anticipated irrigation. Some few growers have already started irrigating. However, most trees have not as yet been in a bad way.

Growers are well on the way in applying their Summer fertilizer application. The third application of young tree fertilizer should be applied before too much longer.

The Valencia crop has been moving at a fairly rapid rate, and there have been some good prices for this fruit.

SOUTH POLK, HIGHLANDS, HARDEE AND DeSOTO COUNTIES

C. R. Wingfield
Phone: Glandale 2-8181
Avon Park, Fla.

By the first of May we were wondering where our moisture had gone. Many growers began irrigation plants while others were making ready when we began to get showers. These showers have been very spotted and welcomed by citrus growers but the tomato and melon growers do not want too much right at this time.

The Summer fertilizer application is well under way and will continue into June. Many have felt the need to get their fertilizer on a little earlier than normal. The rains during winter and early spring have evidently removed much of our elements from the soil and should be replaced in this application.

The crop is still appearing rather spotted but we can see some more fruit than 30 days ago. But I still feel early and mid-season fruit is light. Much of the new crops are being sold or the buyers are locating them for future possibilities.

All citrus insects were active during the dry period and it appears scale and six spotted mite will do some damage before oil can be applied.

NORTH CENTRAL FLORIDA

V. E. Bourland
Winter Garden, Fla.
Phone 107

We had warm and dry weather the first ten days of May, but it started with showers, and we have had some heavy rains up to date which is a blessing. All groves are looking very good, but most of growers are complaining of a short crop of fruit, and hoping for a June bloom, most of groves are showing a new growth, but bloom is yet to come. Growers have been spraying, and are fertilizering, or planning to soon, which is a little earlier than usual. Young trees have made a wonderful growth, and beginning to show second growth.

Valencias are being picked rapidly, and bringing a good price.

ADVERTISEMENT — LYONS FERTILIZER COMPANY

Uncle Bill Says:

I kin remember the time when a lot of folks figgered that us Florida growers was raisin' so much fruit they soon wouldn't be no market fer all the citrus we was producin'.

I never made no claims of bein' a professional forecaster, but right now it seems that in spite of the large plantin's of new groves in Florida, the market is a long ways from bein' overloaded. Course one reason fer this situation is that the cannin' and processin' folks has found so many new ways to use our fine Florida citrus that it ain't near so hard to find a market fer so-called surplus fruit as it used to be . . . indeed, this past season or two there ain't been no surplus.

Then they is another Florida citrus bein' developed fer us. Once Florida raised a lot of lemons, but the "big freeze" killed most of 'em and since then we've been inclined to let the market fer this popular fruit go unchallenged to California. The Citrus Experiment Station folks now is makin" a survey of the right sort of lemon stock to use which will be productive in Florida, and already about 4000 acres has been planted to lemons and before long Florida will again be havin' a big volume of lemons.

Another thing which is helpin' to build up bigger markets fer our citrus crops is that, more than ever before, Florida citrus growers is makin' a most effective effort to improve our products, with the result that both oranges and grapefruit is of better quality than they has been in a long time

They is a lot of ways in which the high quality of Florida's citrus crop kin be kept at top peak, but fer us we feel that most growers, like us, kin produce maxiuum crops of finest quality by usin' Lyons fertilizers.

1958-59 Season's Report of Federal-State Frost Warning Service

Scope of Service

The U. S. Weather Bureau, Department of Commerce, in cooperation with the Agricultural Experiment Stations of the University of Florida operates the Federal-State Frost Warning Service for all of peninsular Florida. This service has now completed its 24th year of operation, a weather service for the benefit of agriculture.

Character of the 1958-59 Season

The 1958-59 season, as compared to previous seasons, was relatively warm with excessive rainfall. Cold damage to citrus was generally light, however truck was hard hit, not as much by cold as by excessive rain which caused flooding and increased the disease and pest hazards.

The first cool weather of the year occurred in the north portion of the state on November 22, but freezing temperatures did not occur until November 30, and it wasn't until December 13 that freezing occurred generally over all the northern districts. In the central districts freezing temperatures were confined to a few of the colder locations during December and it was not until January 11 that the first general freeze occurred in this area, which was the first freeze of the winter for the Everglades.

It was not until January 18 that the Lower East Coast experienced their first freezing temperature. With two major and several minor outbreaks of cold air, January was the coldest month of the season. The first of these occurred on the 11th and 12th and the other during the period from the 17th through the 19th. The majority of the lowest temperatures for the season was reported on January 11, however, some occurred on various other nights during the two periods. February and March were rather warm with only a few minor cold outbreaks in the north and central districts, however, freezing did occur in the southern districts on March 3.

Rainfall for the season averaged far above normal with the wettest period occurring from the latter part of February through March. Some areas experienced over 30 inches of rainfall for the season.

November was unseasonably warm with only two cold nights during the month. They were confined to the Gainesville District, occurring on the 22nd and 30th, while slightly cooler air penetrated only as far south as the central districts. Rainfall averaged near normal in most areas. In the north and central districts it occurred mostly during the first ten days and some irrigation was needed near the end of the month. A few heavy showers occurred in the northern districts and in the Lower East Coast District.

December for the first ten days, continued unseasonably warm. On the 11th, cold air began moving into the state, giving the Gainesville District a succession of cold nights with frost which lasted through the 22nd. On the 13th, the cold air penetrated as far south as the central districts bringing this area its first frost and freezing temperatures of the year. Again on the 18th, cold air moved down the peninsular causing frost in central districts on the 19th and 20th and as far south as the Everglades on the 19th.

Following this outbreak, temperatures once again were above normal and remained so the remainder of the month. Rainfall during the month was slightly above normal and rather beneficially distributed throughout the month until heavy showers occurred over most districts on the 26th and 27th. The lower East Coast was the heaviest hit with 12.85 inches falling at Ft. Lauderdale on the 26th.

January's mild beginning came to an end on the 5th when a cool air mass dropped temperatures to the mid 30's in the extreme north. On the 9th, the first major outbreak of cold air began moving into Florida and one of the coldest periods of the season followed. On the 11th and 12th, frost and freezing temperatures extended to the Everglades. Temperatures ranged from the low to mid 20's in the northern districts, the mid to high 20's in the central districts, the low 30's in the Everglades to the mid 30's along the Lower East Coast. The second outbreak of cold air occurred from the 17th through the 19th, when temperatures again ranged from the low 20's in the north to the low 30's in the Everglades and near freezing in the Lower East Coast.

A sharp warming trend followed until the 22nd when another cold air mass penetrated the northern districts on the 23rd and 24th. Mild weather followed for the remainder of the month. Heavy rainfall occurred the first few days of the month with light to moderate showers later on, resulting in above normal rainfall for most all areas.

February was a warm month with only two cold nights. These occurred on the 21st and 22nd and were confined to the extreme north portion of the state. Rainfall was once again above normal in most areas.

March was slightly cooler than February but the cold was restricted to minor outbreaks which did not penetrate very far into the state. The exception was the 3rd, in which case it was as cold in southern districts as it was in the northern districts when the temperatures reached the low 30's in the colder locations. Other minor outbreaks occurred on

SOUTHERN DOLOMITE
PALMETTO, FLORIDA
PHONE: BRADENTON 2-1411

the 7th, 8th, 13th and 14th, followed by warm weather for the remainder of the month.

Rainfall for the month was extremely heavy in most all areas of the state to the extent that numerous long time records were broken. High winds also occurred repeatedly during the month, especially along the East Coast, where gusts to 50 MPH occurred on the 19th.

Damage to citrus was relatively light although rather heavy defoliation did occur during the two freezes in January, confined mostly to trees cut back as a result of last season's freezes and young trees which were exposed. Complete loss of leaves and branches up to 18 inches long was noted in the coldest places in north and central districts and in isolated cases young trees were killed to the bank. Damage to fruit and healthly mature trees was small, however, heavy firing was necessary on Jan. 11th, 12th, 18th and 19th.

While citrus came through the season with only minor damage, truck crops did not fare so well. The January freezes killed all but the hardiest truck in the north and central districts, did considerable damage in the Everglades and spotty damage in the Lower East Coast. Further damage due to frost was done to 10-15 per cent of corn and beans on the 3rd of March in the Everglades and some spotty damage in the Lower East Coast.

Excessive rainfall throughout the season hampered truck farming with the largest amount of damage occurring during the month of March. Crops not only suffered from flooding but from disease and fungi since spraying operations were impossible during the wet weather and many crops were almost a total loss. Additional damage was done by high winds which occurred several times during the season reaching gusts of 40 to 60 MPH.

Projects with regard to relation of weather and various cultural practices are carried on in cooperation with the research staffs of the Florida Agricultural Experiment Stations and private companies. Temperature and rainfall data for groves and fields, covering many years, are used in aiding the agricultural industry in locating the most desirable sites - weatherwise - for expansion.

Research on weather forecasting, especially that of minimum temperature and frost, is being continued on a permanent basis.

Distribution of Forecasts

The Press Wire Services disseminated the forecast bulletins promptly to all newspapers and radio and TV stations, which broadcast the bulletins on a regular schedule. Schedules of broadcast and forecast district map were published and distributed to growers and appeared in Citrus Mutual's "Triangle" and in other grower publications.

Numerous growers make arrangements with their local Western Union office to have the twice-daily forecast bulletin delivered to them for the nominal CND telegraph charge. Some growers had special messages sent directly to them collect from the Lakeland office whenever critical weather was predicted for their holdings.

Weather broadcasts were made by meteorologists from the Lakeland office over WLAK, Lakeland, WPLA, Plant City and WIPC, Lake Wales.

USDA RECOMMENDS EXPORTING BETTER QUALITY CITRUS

To compete more successfully in the European market, Florida citrus shippers should pack fruit of better quality than the average U. S. No. 1 grade of fruit, according to a report issued recently by the U. S. Department of Agriculture.

Fruit for export should show less damage from scars and blemishes, especially those caused by rust mite and melanose, and all fruit should be at least "fairly well colored," the report states.

Agricultural Marketing Service researchers also found that oranges should be precooled as soon as possible after picking and kept cool while being transferred aboard ship. Temperatures in the ship holds should be maintained at about 35° F. for oranges and at about 50° for grapefruit. Fruit should be treated with sodium orthophenylphenate-hexamine solution and packed with diphenyl treated packing materials to reduce decay.

Eight shipping tests were made from Florida ports and one with Florida citrus loaded at New York. The tests sought to determine the effect on condition of fruit at destination of (1) quality of fruit packed, (2) kind of package, (3) precooling, (4) fungicidal treatments, and (5) temperatures on board ship. Simulated shipping tests under controlled temperatures were also made at Orlando, Fla.

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DEMONSTRATION SET ON PILOT FORESTS IN 12 FLORIDA COUNTIES

Twelve Florida counties have been selected for establishment of pilot forests in conjunction with the Southern Pulpwood Conservation Association's 1959 Pulp and Paper Day Program.

T. G. Herndon, forester with the Florida Agricultural Extension Service, reports that Alachua, Baker, Calhoun, Duval, Jackson, Orange, Putnam, Santa Rosa, Suwannee, Volusia, Wakulla and Walton counties are among 100 counties in 12 southern states for demonstration sites.

According to T. M. Courtney, chairman of the Florida committee, pulp and paper companies have agreed to do a complete forestry job on these selected woodlots. Companies cooperating in the Florida projects include Regis, Continental Can, Owens-Illinois, Hudson, International, and the Buckeye Cellulose Corporation.

Under the intensive forest development program, the owner of the land will receive all of the proceeds from timber harvests, though the participating pulp and paper mills will provide the necessary forestry supplies, equipment, and technical advice.

All of the work will be performed without charge to the landowner. After the properties are placed under ideal forest management, they will serve neighboring landowners as permanent guides to good forest practices.

Florida's peanut acreage has dropped from a high of 480,000 acres in 1939 to 128,000 acres in 1957, with cotton dropping from 319,000 acres in 1911 to only 22,000 acres in 1946.

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